

Properties Prediction of Torrefied Municipal Solid Waste using Linear Correlation Model

*Nur Ashikin Jamin, Suriyati Saleh and Noor Asma Fazli Abdul Samad**

Faculty of Chemical & Natural Resources Engineering, Universiti Malaysia Pahang,
Lebuhraya Tun Razak, 26300 Kuantan Pahang, Malaysia

Abstract

In Malaysia, municipal solid waste (MSW) management has been one of the main issues that closely related to the environmental pollutions and human health risks. One of the promising method to utilize MSW as a fuel is gasification. However, MSW possess some drawbacks in terms of its properties such as high moisture content and low high heating value (HHV) which lead to the reduction of gasifier efficiencies and the quality of product gas produced. In order to overcome the problem, torrefaction process can be employed for upgrading the properties of MSW. Although torrefaction process has been widely implemented but correlation analysis of the quality of torrefied product is rather limited. This correlation analysis is indeed important as a tool to assess the suitability of biomass in torrefaction process. This is due to the fact that although the torrefaction process is able to increase some of the properties, the increment for certain biomass is deemed low and insignificant. Therefore, there is a need for a simple correlation analysis to help in the biomass selection for torrefaction purposes. In this work linear correlation models for MSW involving food waste and wood waste have been developed as a function of mass loss in order to predict the ultimate analysis of C, H, and O elements, proximate analysis of ash content, volatile matter (VM) and fixed carbon (FC) as well as high heating value (HHV) and energy yield (EY). In this study, high coefficient determination was achieved using the developed linear correlation models ($R^2 > 0.87$) for predicting H element, O element, VM, FC, HHV and EY. This suggests that the linear correlation models can be used to predict of the MSW characteristics after torrefaction process.

Keywords: linear correlation; torrefaction; municipal solid waste; food waste; wood waste
